



# Introduction to Occupational Health, Diseases, and Prevention

No objectives were given. 438 objectives:

- **Define Occupational Health.**
- **Enlist major diseases related to occupational hazards.**
  - **Physical hazards such as heat, light, pressure, noise, radiation, electricity, and mechanical factors.**
  - **Chemical hazards such as gases, fumes, dust, metals and solvents.**
  - **Others including biological agents, occupational cancers and dermatosis.**
- **Understand signs and symptoms and diagnosis of occupational diseases of public health importance.**
- **Discuss the scope of occupational health and safety.**

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- Main text
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- Doctor's notes 438
- Doctor's notes 439
- Important
- Extra



# Occupational Health Definitions

## Occupational Health

- Occupational health and safety is a discipline with a broad scope involving many specialized fields; occupational medicine, industrial hygiene, toxicology, engineering safety, ergonomics, psychology, etc.

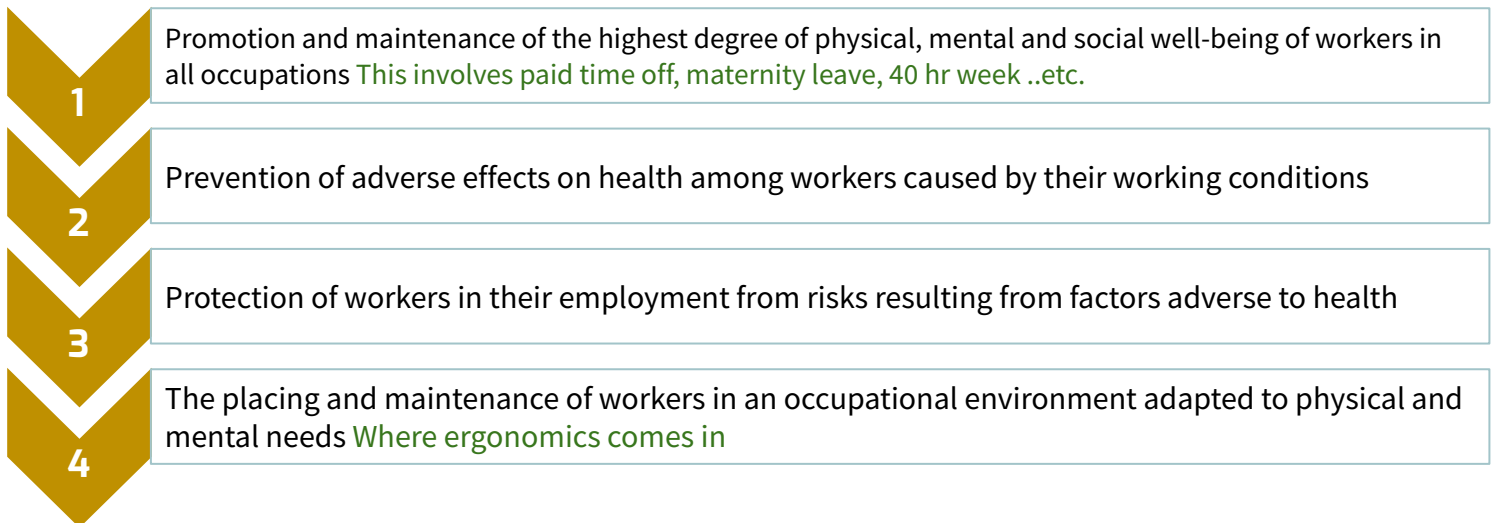
## Industrial Hygiene

- Activities directed to **identifying, assessing, preventing, and managing hazards** to the worker. In the working environment, falls in the domain of Occupational Safety and Health (OSH).<sup>1</sup>
- These activities should be systematic and scientific.

## Ergonomics

- Stress evaluation occurring in a work environment and the ability of people to cope with these stresses.<sup>2</sup>
- Designing suitability, the facilities, furniture, equipment, tools, and job demands to make them compatible with the work-force capabilities and limitations.
- Example: having a rest support under the wrist can prevent carpal tunnel syndrome

## Aims of Occupational Health and Safety:



- In other words, occupational health and safety encompasses the **social, mental and physical well-being** of workers, that is the "whole person".

1. OSH is a new domain that has its full set of protocols, policies, procedures and assessment criteria to ensure the protection of workers.  
2. Ergonomics (or 'human factors' as it is referred to in North America) is a branch of science that aims to learn about human abilities and limitations, and then apply this learning to improve people's interaction with products, systems and environments. It is the process of designing or arranging workplaces, products and systems so that they fit the people who use them.

# Occupational Safety vs Occupational Health

- Occupational health issues are often given less attention than occupational safety issues because the former are generally more difficult to confront.
- A healthy workplace is by definition also a safe workplace.
- A so-called safe workplace is not necessarily also a healthy workplace.
- Issues of both health and safety must be addressed in every workplace

Occupational safety: makes sure there is no direct hazard

Occupational health: has to do with the whole workplace like mental health, number of hours you work and long term consequences of working in occupations that have a risk

## History <sup>1</sup>

1870

With increasing industrialization many vulnerable people were working in hazardous environments

1919

Creation of the international labor organization (ILO)

1910-1960

Major workplace disasters resulted in protests and formation of labor unions. Some worker compensation rules established at the local level.

1970

OSH (occupational safety and health) act established a worker's right to a safe workplace

1971

OSHA (occupational safety and health administration) is established as the federal body responsible for ensuring employers provide safe workplaces.<sup>2</sup>

1972

NIOSH (National institute of occupational and safety health) is established as the research arm of OSHA informing their rules and regulations with data

## Impact of Work-Related Disease and Injury

- Globally, someone dies every fifteen seconds from an occupational disease or fatal work-related injury.
- The International Labor Organization (ILO) estimates that more than 2.3 million deaths occur annually from work-related causes.
- Another 313 million incidents occur each year that result in serious and disabling injuries
- Results in an economic burden of 4% on global GDP

1. Know what OSH and OSHA mean and where they come from.  
2. They're responsible for regulations licensing, or shutting down workplaces.

# Impact of Work-Related Disease and Injury

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- Another 313 million incidents occur each year that result in serious and disabling injuries
- Results in an economic burden of 4% on global GDP
- Nearly half of recorded injuries require at least a day away from work, a job transfer, or work restriction for recovery
- Fatal and nonfatal work injuries in the US cost more than \$200 billion in 2013. The same range as the estimated costs of dementia or of diabetes.
- Estimates of work-related injuries substantially understate the incidence of workplace injuries, probably by between 40% and 70% . The actual costs of workplace injuries are also likely to be far higher than current estimates
- For most occupational illnesses ( particularly occupational cancers) there is usually a time lag between exposures and development of symptoms<sup>1</sup>. In part because of this latency, most illnesses with an occupational cause or contribution are not recognized as work related.
- In the US, More than 500,000 workers employed in health care and social assistance jobs are injured<sup>2</sup> each year, the largest number in any industry. The likelihood of a hospital worker being injured on the job is higher than that for a worker in construction or manufacturing.

## Direct and Indirect cost of Occupational injury

### Some of the direct costs of an injury or illness for workers

- the pain and suffering of the injury or illness
- the loss of income
- the possible loss of a job
- health-care costs. No insurance or access to free health care.
- The indirect costs of an accident or illness can be four to ten times greater than the direct costs.

### Some of the direct costs of an injury or illness for employers

- payment for work not performed u
- medical and compensation payments
- repair or replacement of damaged machinery and equipment
- reduction or a temporary halt in production
- increased training expenses and administration costs
- possible reduction in the quality of work
- negative effect on morale in other workers.

## Vulnerable Workers

1

Workers that have high exposures

4

Not likely to be represented by a union like those that work in amazon and uber.

2

Many low wage jobs are also high-hazard jobs

5

less likely to report hazardous conditions due to fear of retribution (e.g. losing job, being reported to authorities, etc

3

Usually immigrant, undocumented, disenfranchised

1. Makes it difficult to link to occupation, so it's not considered an occupational disease.
2. Stress, burn out, violence, harassment.

# Occupational Diseases

## Definition 438

- Occupational diseases are adverse health conditions in the human being, the occurrence or severity of which is related to exposure to factors on the job or in the work environment.

### Physical

Heat and cold, noise, radiation, light, UV radiation, Ionizing Radiation, Vibration (like Jack hammer, Bus drivers on bus seats)

### Biological<sup>1,2</sup>

Infective agents: TB, HBV and HIV

### Psychosocial

lack of control over work, inadequate personal support. Results in psychological and Psychosomatic effects.<sup>3</sup>

## Types of Hazards

### Chemical

(Solvents, pesticide, heavy metals and dust.) it can be due to local effects, inhalation of dusts, gases, and metals, or it can be due to ingestion.

### Ergonomics

improperly designed tools or work areas, repetitive motions and physical strains

### Mechanical

these mainly cause work accidents and injuries rather than occupational diseases. They are associated with machinery

## Characteristics of Occupational Diseases:

- The **clinical and pathological presentation** are **identical** to that of non-occupational diseases; Example: asthma
- Occupational disease may **occur after the termination of exposure**. **Latency Period**  
Example: asbestos-related mesothelioma (a cancer affecting the lung and abdomen) which can occur 30 or 40 years after the exposure.
- The clinical manifestations of occupational disease are related to the **dose** and **timing of exposure**<sup>4</sup>  
Example: at very high airborne concentrations, elemental mercury is acutely toxic to the lungs and can cause pulmonary failure, while at lower levels of exposure, elemental mercury has no pathologic effect on the lungs but can have chronic adverse effects on the central and peripheral nervous systems.
- Occupational factors can **act in combination** with non-occupational factors to produce disease  
Example: exposure to asbestos (five-fold increase in lung cancer (**Mesothelioma**)); and the long-term smoking of cigarettes (increases the risk by 50 and 70 fold).

- Health care providers are at a greater risk against biological hazards
- Most commonly seen in health care. An example is working in labs, with animals, or in dairy manufacturers
- Examples of psychological effects include anxiety and depression. Example of Psychosomatic effect includes pain syndrome.
- COVID-19 is a time dependant. For someone to have an increased risk of getting COVID-19, 20 mins of direct exposure is required to get the infection.

# Types of Occupational Health Effects

## Occupation Specific Diseases

- ❑ Asbestos exposure leads to Asbestosis
- ❑ Silica exposure leads to Silicosis
- ❑ Hay or grain dust exposure leads to Farmer's Lung
- ❑ Coal exposure leads to Coal miner's lung
- ❑ Cotton dust exposure leads to Byssinosis

## Chemical specific health effects

- ❖ Lead poisoning **No longer an issue for ambient air quality in developed countries because it's removed from gasoline.**
- ❖ Mercury poisoning (e.g. mad hatter's diseases)<sup>1,2</sup>

## Occupational cancers

- Lung cancer from nickel, chromates, asbestos, coal tar, arsenic and chromium.
- Skin cancer from coal tar, oils and dyes. (e.g. chimney sweeps, oil refiners).
- Bladder cancer from aromatic amines like aniline.
- Leukemia from benzol.

## Features of Occupational Cancers:

- 1 Result from prolonged exposure
- 2 Period between exposure and disease development is usually between 10 -30 years
- 3 Can result even after cessation of exposure
- 4 The average age incidence is earlier than for cancer generally
- 5 Localization of tumors is consistent amongst specific occupation  
**Asbestos causes mesothelioma and Aniline causes bladder cancer.**

1. A neurological disease that developed in hatters due to the presence of mercury in the materials they used to make he hats.
2. Minamata disease disease caused by mercury poisoning is not an occupational disease because it isn't caused by an occupational hazard

# Types of Hazards

Physical Agents	
Factor	Description
<b>Heat</b> <sup>1</sup>	Heat hyperpyrexia, exhaustion, syncope, cramps, burns
<b>Cold</b>	Trench foot (gangrene in feet of soldiers who worked in trenches), frostbite
<b>Light</b>	Occupational cataracts, miner's nystagmus
<b>Pressure</b>	Caisson disease <sup>2</sup> , air embolism, blast (explosion)
<b>Noise</b>	Occupational deafness
<b>Radiation</b>	Cancers, leukemias, aplastic anemia, pancytopenia
<b>Mechanical Factors</b>	Injuries, accidents
<b>Electricity</b>	Burns
Chemical Agents	
<b>Gases</b> :CO <sub>2</sub> , CO, HCN, N <sub>2</sub> ,NH <sub>3</sub> ,HCL <b>Chemicals</b> : Acids, alkalis, pesticides	Occupational cancers; Skin, lung, bladder Occupational dermatosis; Dermatitis and eczema
<b>Dusts (pneumoconiosis)</b>	Coal dust (anthracosis), silica (silicosis), asbestos (asbestosis, Ca lung), iron (siderosis) Cane fiber (bagassosis), cotton dust (byssinosis), tobacco (tobacossosis), hay or grain dust (farmer's lung)
<b>Metals and their compounds</b>	Toxicity from Lead, mercury, cadmium, mercury, arsenic
Other Agents	
<b>Biological agents</b>	Brucellosis, leptospirosis, anthrax, tetanus, encephalitis, fungal infections
<b>Ergonomic Hazards</b>	Back pain, joint issues, carpal tunnel disease, chronic muscular pain, pain syndromes, Prolapsed disc
<b>Psychological origin</b>	Industrial neurosis, hypertension, peptic ulcer

1. Construction workers, chefs and other workers have a greater risk of hyperpyrexia and heat strokes especially here in KSA
2. Decompression sickness (also known as divers' disease) describes a condition arising from dissolved gases coming out of solution into bubbles inside the body on depressurisation (as someone goes back up after deep dives)

# Pulmonary Dust Disease



## Pneumoconiosis

- **Pneumoconiosis** is a disabling pulmonary fibrosis that results from the inhalation of various types of inorganic dust, such as silica, asbestos, coal, talc and china clay.

Example: silicosis and asbestosis (the two most important causes of pneumoconiosis)

## Types of Pneumoconiosis:

### 1 Asbestosis

Description	Inhalation of asbestos fibres. An insulating material used in manufacturing.	
Occupations	<ul style="list-style-type: none"> <li>• Mining and extraction</li> <li>• Exposure to asbestos (insulation)</li> <li>• making of asbestos cloth (soldiers clothes)</li> <li>• manufacture of asbestos cement pipes and other products, Such as vinyl floor tiles, in brake and cloth lining (fire resistant)</li> </ul>	
Presentation	<ul style="list-style-type: none"> <li>• Interstitial fibrosis of the lungs, pleural thickening, calcification.</li> <li>• Bronchogenic carcinoma, pleural and <b>peritoneal mesothelioma</b></li> <li>• Progressive dyspnoea on exertion frequently out of proportion to the clinical signs in the lungs, cough, expectoration, chest pain, cyanosis and <b>clubbing of the fingers</b></li> </ul>	
Diagnosis	<ul style="list-style-type: none"> <li>• Asbestos bodies in <b>sputum</b> (asbestos fibres coated with fibrin)</li> <li>• X-ray shows <b>ground-glass appearance</b> in the lower 2/3 of the lung →</li> </ul>	
Progression	Progressive disease takes 10-20 yrs to develop.	
Prevention	Prevention and periodic examinations	




Long time ago, insulators were made of asbestos. Asbestos is an important risk factor for mesothelioma which can present with chest pain (pleuritic) and SOB with unexplained weight loss.

Asbestos is of two types - serpentine or chrysolite variety (90%) and the amphibole type. Asbestos is used in the manufacture of asbestos cement, fireproof textiles, roof tiling, brake lining, gaskets and several other items. Asbestos enters the body by inhalation, and fine dust may be deposited in the alveoli. The fibres are insoluble. The dust deposited in the lungs causes pulmonary fibrosis (due to mechanical irritation), leading to respiratory insufficiency and death; carcinoma of the bronchus; mesothelioma of the pleura or peritoneum; and cancer of the gastrointestinal tract.



# Pulmonary Dust Disease

## 2 Silicosis

<b>Description</b>	Absorption of high amount of crystalline silica (SiO <sub>2</sub> )	
<b>Occupations</b>	<ul style="list-style-type: none"> <li>• Mining (Coal, mica, gold, silver, lead, zinc)</li> <li>• Stone cutting and shaping, sandblasting (Building and construction areas)</li> <li>• Iron and steel industry</li> <li>• <b>Glass and Ceramic manufacturers</b></li> </ul>	
<b>Time</b>	7–10 years, sometimes less. Prolonged exposure to higher concentrations of dust	
<b>Presentation</b>	<ul style="list-style-type: none"> <li>• Dyspnoea on exertion, irritant cough and chest pain</li> <li>• Pulmonary tuberculosis (<b>silicosis can activate latent TB</b>)</li> <li>• Cardiac or respiratory failure</li> <li>• Impaired TLC (total lung capacity) in advanced disease</li> </ul>	<p><b>SILICOSIS IN CERAMIC WORKERS</b></p> <ul style="list-style-type: none"> <li>• In a study in Manisa, 365 exposure to silica and ceramic of workers;             <ul style="list-style-type: none"> <li>– Glazing, glaze preparation in the foundry department, that exposure to dust.</li> <li>– Total of 24 cases of silicosis that exposure time ranging between one and 21 years, were identified (6.57%).</li> <li>– In a study Gimmn A. and colleagues also found that silicosis were 6.02% in ceramic factory workers.</li> </ul> </li> </ul> <p><small>Source: A. Gimmn, A. Tokdemir, M. Tokdemir, 2005, 53, 140-53 Gimmn A. et al., Tokdemir M. Tokdemir 1999, 47, 104-109</small></p>
<b>Diagnosis</b>	<ul style="list-style-type: none"> <li>• X-ray shows <b>snow storm appearance</b> (Scattered micro-opacities and might also present with cavitation in upper lobe of the lung because of TB activation)</li> </ul>	
<b>Progression</b>	Progressive (irreversible) disease and converts to TB "silico-tuberculosis"	
<b>Prevention</b>	Prevention and regular physical examinations regular check ups. <ul style="list-style-type: none"> <li>- Education about the importance of protection →</li> </ul>	



## Lead Poisoning (Plumbism) 438 slides

### Definition:

- Defined as **lead level of 70 µg/ 100 ml** with clinical signs and symptoms
- Occupational usage (Industrial):
  - Storage batteries, glass, ship building, printing and potteries, rubber
- Non-occupational :
  - **Gasoline**, drinking water via **lead pipes, paints** (shine in paints), toys



### Modes of absorption:

**Inhalation** of fumes and dust



**Ingestion** through food or drink



**Skin absorption** "tetraethyl lead"  
(only organic lead)

### Clinical features:

<b>Organic Lead</b>	Insomnia, headache, mental confusion and delirium
<b>Inorganic Lead</b>	Plumbism (lead poisoning), abdominal colic, obstinate constipation (very severe), loss of appetite, blue lines on the gum, anemia and wrist and foot drop

## Lab diagnosis:

- Coproporphyrin in urine (screening test)
- Amino levulinic acid in urine
- Lead levels in blood and urine
- Basophilic stipling of RBCs (very sensitive)



## Methods of prevention:

- 1 Substitution (with other materials)
- 2 Isolation (segregate procedures with risk)
- 3 Local exhaust ventilation
- 4 Personal protection (should be disposed of after finishing)
- 5 Periodic examinations (through coproporphyrin in urine)
- 6 Health education and personal hygiene (handwashing)

## Occupational Cancers ★

Carcinogenic agent	Organ affected
Arsenic	Skin and lung
Chromium compounds, hexavalents	Lung
Nickel	Lung and nasal sinus
Polycyclic aromatic hydrocarbons	Skin
Coal tars	Skin, scrotum, lung and bladder
Benzol	Blood (leukaemia)
B-naphthylamine	Bladder
Ionizing radiation	Skin, bone, lung and blood (leukaemia)
Asbestos	Lung, pleura, peritoneum



## Causes:

- Heat, cold and moisture
- Friction and pressure
- X-rays
- Acids, alkalis, solvents, grease, tar and pitch
- Bacteria and fungi
- Leaves, vegetables and fruits



## Classification

Primary Irritants

Sensitizing Substances

## Prevention:

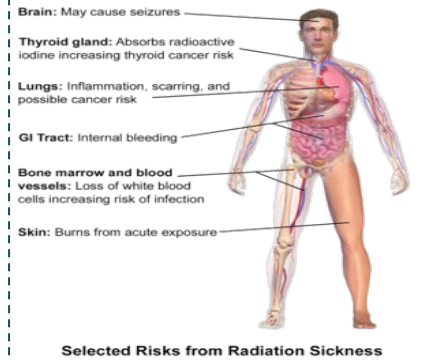
- 1 Pre-selection (pre-employment check)
- 2 Protection (protective equipment)
- 3 Personal hygiene
- 4 Periodic assessment (usually every 6 months)

## Radiation Hazards 438 slides

### Industrial Exposures:

- Manufacture of radioactive paints
- Painting of luminous dials for watches
- Mining of radioactive ores and sand workers
- X-rays rooms

### Extra!!



### Effects of Radiation:

Acute

Acute burns, dermatitis and blood dyscrasias

Chronic

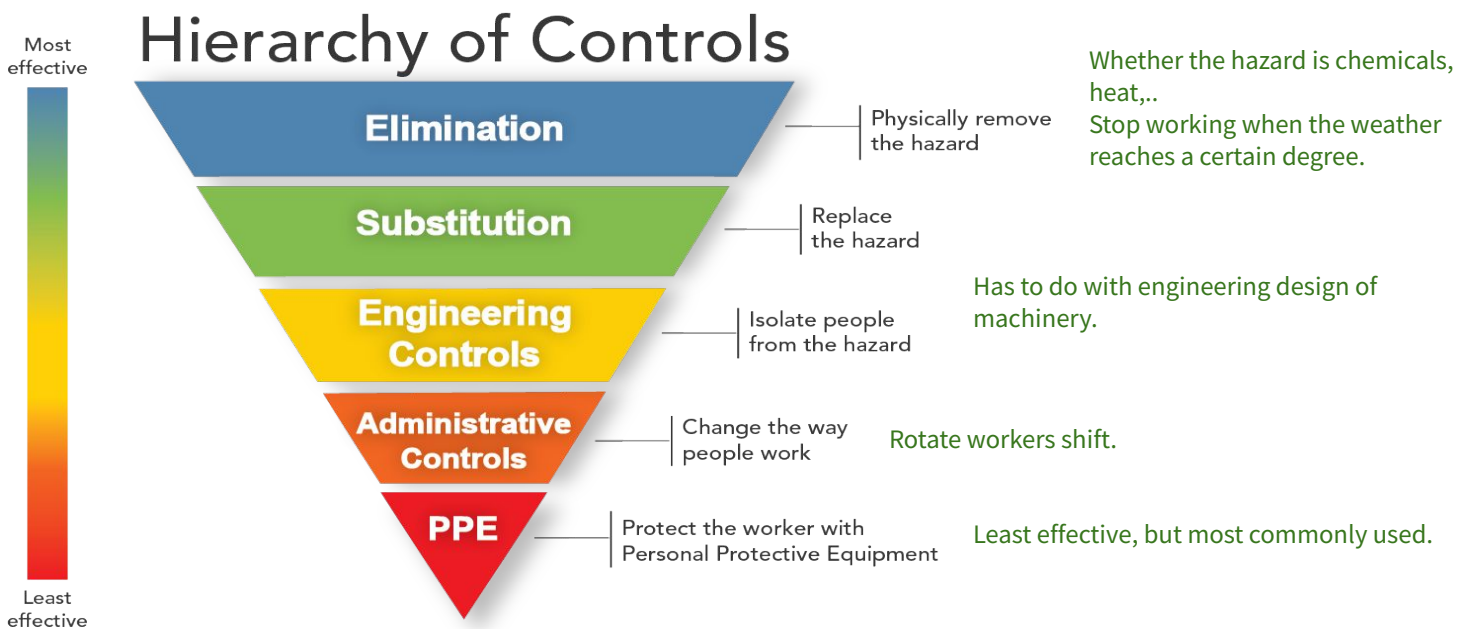
Malignancies (carcinogenic effect) and genetic effects

### Prevention:

- 1 Shielding in x-ray areas, monitoring 6 monthly, for their film badge or pocket electronic device, adequate workplace ventilation, replacement and periodic exams. (badges are available)
- 2 Pregnant ladies should not be allowed to work in the area.

1. Primary irritants (e.g. acids, alkalis, dyes, solvents, etc.) cause dermatitis in workers exposed in sufficient concentration and for a long enough period of time.
2. Sensitizing or allergic dermatitis occurs only in small percentage of cases, due to sensitization of the skin to certain materials

# Control and Prevention of Occupational Hazards ★



1. Know the hazards of the work that affect the workers so they can take on the risk willingly and that affect the managers so the manager can make sure the workplace is safe
2. Where health policy comes in . Research is done to figure out the appropriate amount someone can be exposed to a hazard with the least effect on the health. Example in saudi, workers shouldn't work from 12-3 under the sun.

# Prevention of Occupational Disease 438 slides

Prevention of occupational diseases should be addressed by different measures including: medical measures, engineering measures and legislations.

Field	Measurements
Medical	<ul style="list-style-type: none"><li>• Pre-placement exams</li><li>• Periodic examinations</li><li>• Medical and health care services</li><li>• Notifications, <b>employees should notify the employer with all diseases he has</b></li><li>• Supervision of working environment</li><li>• Maintenance and analysis of records</li><li>• Health education and counseling</li></ul>
Engineering	<ul style="list-style-type: none"><li>• Designing of the buildings <b>build good exhaust systems</b></li><li>• Good housekeeping</li><li>• General ventilation <b>ACs, windows, ...etc.</b></li><li>• Substitution <b>any harmful substance used should be replaced</b></li><li>• Dusts</li><li>• Enclose</li><li>• Isolate</li><li>• Local exhausts ventilations</li><li>• Protective devices <b>based on the occupation</b></li><li>• Environmental monitoring</li><li>• Research</li></ul>
Legislations	<ul style="list-style-type: none"><li>• Policies and regulations for factories, work places, health of the workers</li></ul> <p><b>Example:</b> insurance, sickness policies and disability benefits</p>

Dr. Hafsa recommended reading about the measurements from the book. [Link here](#)

## WORK SAFETY



## Practice Questions

**Q1: Which one of the following could cause peritoneal mesothelioma**

A. Anthracosis

B. Lead poisoning

C. Silicosis

D. Asbestosis

**Q2: Patient present with dyspnea on exertion X ray was done and shows snow storm appearance most likely diagnosis**

A. Anthracosis

B. Lead poisoning

C. Silicosis

D. Asbestosis

**Q3: Which one of the following can be considered vulnerable workers:**

A. Likely to be represented by a union

B. Low wage jobs

C. Likely to report hazardous conditions due to fear of retribution

D. Workers that have low exposure

**Q4: "is a disabling pulmonary fibrosis that results from the inhalation of various types of inorganic dust"**

A. Occupational Health

B. Pneumoconiosis

C. Silicosis

D. Lead poisoning

**Q5: what findings would favor diagnosis of Asbestos:**

A. Asbestos bodies in sputum

B. ground-glass appearance in X ray

C. MRI

D. A&B

**Answer key:**

1 (D) , 2 (C) , 3 (B) , 4 (B) , 5 (D)

## 438 Practice Questions

**Q1:** A lead miner was admitted to the hospital complaining of irritant cough and shortness of breath particularly whenever he exerts some effort. X-ray showed patchy areas of nodular opacities. History showed that the patient never performed an periodic occupational examination. What is your diagnosis?

A. Anthracosis	B. Lead poisoning	C. Silicosis	D. Asbestosis
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**Q2:** Which of the following cancers is most likely to occur in workers dealing with hydrocarbon containing gasoline?

A. Skin and lung cancers	B. Skin, scrotum, lung and bladder cancers	C. Blood cancer (leukemia) only	D. Skin cancer only
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**Q3:** All of the following are characteristics of occupational diseases EXCEPT

A. Identical to non-exposed disease	B. Can be prevented if the person quits his job	C. Related to the dose of exposure	D. Related to the length of exposure
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**Q4:** Which of the following terms best defined the following statement: "It is the promotion and maintenance of the highest degree of physical, mental, and social well-being of workers in all occupations"?

A. Occupational Health	B. Occupational Safety and Health (OSH)	C. Industrial hygiene.	D. Ergonomics
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**Q5:** Which of the following tests is the best screening test for occupational workers in lead industries?

A. Blood smear to check for basophilic stippling	B. Amino levulinic acid levels in urine	C. Direct lead levels in blood	D. Coproporphyrin in urine
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**Answer key:**  
1 (C) , 2 (D) , 3 (B) , 4 (A) , 5 (D)

## 439 Team Members



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